

WHAT IS CLAIMED IS:

1. A system, comprising:
a processor; and
5 a memory comprising program instructions, wherein the program instructions are executable by the processor to implement:
file system software configured to assign and migrate data in a multi-class file system comprising a hierarchy of storage classes, wherein one or more of the storage classes store data that is not modifiable by applications while the data is on the one or more storage classes;
10 and
an application configured to perform an operation that requires stable data, wherein, to perform the operation on the one or more storage classes that store data that is not modifiable by applications while
15 the data is on those storage classes, the application is configured to perform the operation without using a split mirror of the one or more storage classes.
2. The system as recited in claim 1, wherein the operation is a backup of the storage
20 classes.
3. The system as recited in claim 1, wherein, to perform the operation on one or more others of the hierarchy of storage classes, the application is further configured to perform the operation using a split mirror of the one or more other storage classes.
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4. The system as recited in claim 3, wherein the one or more other storage classes store data that is modifiable by the applications while the data is on those storage classes.
5. The system as recited in claim 3, wherein the operation is a backup of the storage
30 classes.

6. The system as recited in claim 1, wherein the one or more storage classes that store data that is not modifiable by applications while the data is on those storage classes are configured to be write locked, and wherein, to perform the operation without using a split mirror of the one or more storage classes, the application is further configured to:

5 examine a write lock of each write-locked storage class to determine if the storage class could have been written to during the operation on that storage class;
 and
 if the storage class has been written to during the operation on the storage class, retry the operation for the storage class.

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7. The system as recited in claim 1, wherein the application is further configured to block the file system software from enabling the write-locked storage class for writing for the duration of the operation.

15 8. The system as recited in claim 1, wherein the data includes files or portions of files.

9. The system as recited in claim 1, wherein the data comprises one or more of application data and file system metadata.

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10. The system as recited in claim 1, wherein the storage classes are ordered in the hierarchy according to one or more characteristics from a highest storage class to a lowest storage class.

25 11. The system as recited in claim 10, wherein the one or more characteristics include one or more of performance and cost.

12. The system as recited in claim 1, wherein the storage classes are ordered in the hierarchy of storage classes according to performance characteristics from a highest
30 storage class comprising one or more high-performance storage devices to a lowest

storage class comprising one or more low-performance storage devices.

13. A system, comprising:

a processor; and

5 a memory comprising program instructions, wherein the program instructions are executable by the processor to implement:

file system software configured to assign and migrate data in a multi-class

file system comprising a hierarchy of storage classes; and

an application configured to perform an operation on the storage classes

10 that requires stable data, wherein, to perform the operation, the application is configured to:

perform the operation on at least one of the storage classes without

using a split mirror; and

perform the operation on at least one other of the storage classes

15 using a split mirror.

14. A system, comprising:

a plurality of storage devices;

a host system configured to couple to the plurality of storage devices via a
20 network, wherein the host system comprises:

file system software configured to assign and migrate data in a multi-class

file system comprising a hierarchy of storage classes, wherein one

or more of the storage classes store data that is not modifiable by applications while the data is on the one or more storage classes;

25 and

an application configured to perform an operation that requires stable data,

wherein, to perform the operation on the one or more storage

classes that store data that is not modifiable by applications while

the data is on those storage classes, the application is configured to

30 perform the operation without using a split mirror of the one or

more storage classes.

15. The system as recited in claim 14, wherein the operation is a backup of the storage classes.

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16. The system as recited in claim 14, wherein, to perform the operation on one or more others of the hierarchy of storage classes, the application is further configured to perform the operation using a split mirror of the one or more other storage classes, wherein the one or more other storage classes store data that is modifiable by the applications while the data is on those storage classes.

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17. The system as recited in claim 14, wherein the one or more storage classes that store data that is not modifiable by applications while the data is on those storage classes are configured to be write locked, and wherein, to perform the operation without using a split mirror of the one or more storage classes, the application is further configured to:

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examine a write lock of each write-locked storage class to determine if the storage class could have been written to during the operation on that storage class;
and

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if the storage class has been written to during the operation on the storage class,
retry the operation for the storage class.

18. The system as recited in claim 14, wherein the application is further configured to block the file system software from enabling the write-locked storage class for writing for the duration of the operation.

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19. A system, comprising:

software means for assigning and migrating data in a multi-class file system comprising a plurality of storage classes and for providing access to the data in the multi-class file system to one or more applications, wherein one or more of the storage classes store data that is not modifiable by the

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applications while the data is on the one or more storage classes; and
means for performing operations that require stable data on the one or more
storage classes that store data that is not modifiable by the applications
while the data is on those storage classes, without using a split mirror of
the one or more storage classes.

20. The system as recited in claim 19, further comprising means for blocking write
access to the one or more storage classes for the duration of the operations.

10 21. A method, comprising:
file system software assigning and migrating data in a multi-class file system
comprising a hierarchy of storage classes, wherein one or more of the
storage classes store data that is not modifiable by applications while the
data is on the one or more storage classes; and
15 performing an operation that requires stable data, wherein performing the
operation on the one or more storage classes that store data that is not
modifiable by applications while the data is on those storage classes
comprises performing the operation without using a split mirror of the one
or more storage classes.

20 22. The method as recited in claim 21, wherein the operation is a backup of the
storage classes.

23. The method as recited in claim 21, wherein said performing the operation on one
25 or more others of the hierarchy of storage classes comprises performing the operation
using a split mirror of the one or more other storage classes.

24. The method as recited in claim 23, wherein the one or more other storage classes
store data that is modifiable by the applications while the data is on those storage classes.

25. The method as recited in claim 23, wherein the operation is a backup of the storage classes.

26. The method as recited in claim 21, wherein the one or more storage classes that store data that is not modifiable by applications while the data is on those storage classes are write locked, and wherein said performing the operation without using a split mirror of the one or more storage classes comprises:

examining a write lock of each write-locked storage class to determine if the storage class could have been written to during the operation on that storage class; and

if the storage class has been written to during the operation on the storage class, retrying the operation for the storage class.

27. The method as recited in claim 21, further comprising blocking the file system software from enabling the write-locked storage class for writing for the duration of the operation.

28. The method as recited in claim 21, wherein the data includes files or portions of files.

29. The method as recited in claim 21, wherein the data comprises one or more of application data and file system metadata.

30. The method as recited in claim 21, wherein the storage classes are ordered in the hierarchy according to one or more characteristics from a highest storage class to a lowest storage class.

31. The method as recited in claim 21, wherein the storage classes are ordered in the hierarchy of storage classes according to performance characteristics from a highest storage class comprising one or more high-performance storage devices to a lowest

storage class comprising one or more low-performance storage devices.

32. A computer-accessible medium comprising program instructions, wherein the program instructions are configured to implement:

- 5 assigning and migrating data in a multi-class file system comprising a hierarchy of storage classes, wherein one or more of the storage classes store data that is not modifiable by applications while the data is on the one or more storage classes; and
- 10 performing an operation that requires stable data, wherein the operation is performed on the one or more storage classes that store data that is not modifiable by applications while the data is on those storage classes without using a split mirror of the one or more storage classes.

15 33. The computer-accessible medium as recited in claim 32, wherein the operation is a backup of the storage classes.

34. The computer-accessible medium as recited in claim 32, wherein the operation is performed on one or more others of the hierarchy of storage classes comprises using a split mirror of the one or more other storage classes.

20 35. The computer-accessible medium as recited in claim 35, wherein the one or more other storage classes store data that is modifiable by the applications while the data is on those storage classes.

25 36. The computer-accessible medium as recited in claim 35, wherein the operation is a backup of the storage classes.

37. The computer-accessible medium as recited in claim 32, wherein the one or more storage classes that store data that is not modifiable by applications while the data is on those storage classes are write locked, and wherein, in said performing the operation

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without using a split mirror of the one or more storage classes, the program instructions are further configured to implement:

- 5 examining a write lock of each write-locked storage class to determine if the storage class could have been written to during the operation on that storage class; and
- if the storage class has been written to during the operation on the storage class, retrying the operation for the storage class.

10 38. The computer-accessible medium as recited in claim 32, wherein the program instructions are further configured to implement blocking file system software from enabling write access to the write-locked storage class for the duration of the operation.

15 39. The computer-accessible medium as recited in claim 32, wherein the data includes files or portions of files.

40. The computer-accessible medium as recited in claim 32, wherein the data comprises one or more of application data and file system metadata.

20 41. The computer-accessible medium as recited in claim 32, wherein the storage classes are ordered in the hierarchy according to one or more characteristics from a highest storage class to a lowest storage class.

25 42. The computer-accessible medium as recited in claim 32, wherein the storage classes are ordered in the hierarchy of storage classes according to performance characteristics from a highest storage class comprising one or more high-performance storage devices to a lowest storage class comprising one or more low-performance storage devices.